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Thanking the students of the TECH for past favors, I shall endeavor to merit a continuance of the same.

S. GRANT SMITH,

BOSTON, U. S. A.

Co-operative Cards are now ready.

The Tech.

VOL. IV.

BOSTON, MAY 20, 1885.

No. 16.

THE TECH.

Published on alternate Wednesdays, during the school year, by the students of the Massachusetts Institute of Technology.

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NCE more the excitement of examinations, with the feeling of satisfaction, or, at least, of relief, as each is finished, once more the final greetings of friends and classmates, betoken the close of

another, perhaps, the last year of Institute life.

THE TECH, too, ends another year; and it is gratifying to know that the support now given by a majority of the students as subscribers and contributors, the good literary and financial condition assured by the presence, on both boards, of those familiar with TECH duties, and the precedent of four years' successful career, all combine to promise future prosperity.

With the departure of the class of '85, THE TECH loses the support of the only class remaining at the Institute which was present when its publication began,—support and interest always strong, and grown more so by the ad-

vance which the paper has made since its first modest but energetic beginnings.

THE TECH has the heartiest of good wishes of the editors from the class of '85, whose official connection with their college publication is now severed.

THE year is almost over. Only a few more days of agony, and then away for vacation, and this past year of college life will have —

“Gone, glimmering through the things that were.”

We are all happy; joy is engraved on every face, although the horrible terrors of the annuals may dim it a little at present. Eighty-Five will soon be with us no more, for in a few days, —

“Like the dew on the mountain,
Like the foam on the river,
Like the bubble on the fountain,
They'll be gone and forever!”

The Eighty-Six men are commencing to think where they will obtain their stock of dignity with which to do justice to their position as Seniors. The giddy Sophomores dream of the delights of a Junior life, while the humble Freshmen think daily of how they will “come it over” Eighty-Nine, when they walk the earth as proud Sophomores. Yes, the year is drawing to a close, and as we look back over it we find that though it has been a busy one, there are many bright spots among the days of work.

First the torchlight parade; is there one who has forgotten or ever will forget the pleasures (?) of that evening when —

“There was a sound of revelry by night,”
“Midnight shout and revelry.”

To be sure our man was not elected, but then our last *kick* was a good one. And then elec-

tion night! Indeed the Institute was well represented that evening, and the voice of the Tech was heard in the land.

The old complaint that there is little or no social life at the Tech is slowly but surely passing away; every year there is more social intercourse among the fellows, and new clubs are organized. This year, besides the local clubs which have been started, such as the CB₃A, etc., there have been established two new chapters of college fraternities at the Institute (the Alpha Tau Omega and the Theta Xi), both of which are in a most flourishing condition. The series of gymnasium parties has been a great success, while the Senior ball will ever be remembered as one at which the Seniors were really present.

In athletics—well, at any rate, our Athletic Association held three good meetings, the last being the most successful ever held at the Tech. In foot-ball, though we haven't distinguished ourselves, we have *really had one victory* (ditto, so far, may be said of our nine). THE TECH has flourished, and has proved that it can be made a success financially, if properly supported by the students.

Our Glee Club and Orchestra, the latter having been organized this year, have contributed in no small degree to the year's enjoyments, and their concerts deserve much praise. All the classes have had their dinners, and they have been reported as great successes by those who ought to know.

The future Freshmen will think (or at least ought to think) often of the class of Eighty-Eight, when they view the beautiful flags which Eighty-Eight, with the kind assistance of the other classes, was able to win this year. And last, but not least, the Prize Drill—but this is too fresh in our minds to call for any remark. And now, dear readers, having reviewed the past year, we bid you farewell, close our inkstand, and throw down our pen till next September, when, refreshed and invigorated by our vacation, we will again grasp the editorial quill and endeavor to make ourselves entertaining again.

A GLANCE at the examination scheme shows in general a very satisfactory arrangement, as far as can be judged by appearances. One feature, however, which presents itself as objectionable to the student, at least, is the holding of more than one examination in one room at the same time. Possibly, and very probably in most cases, this is unavoidable on account of lack of room, but it is the general feeling of all students that such crowding should as far as possible be avoided. With the holding of two separate examinations in one room, comes the crowding of two men at one desk, each intent on different subjects; the confusing instructions of examiners directed to different portions of the examined; the laborious efforts of the man at one's side wrestling with some knotty problem, possibly his hat and overcoat occupying part of the desk, and his triangles and drawing apparatus ready to be knocked off at one's slightest movement; and the general lack of the quiet and comfort which frequently play an important part in the success of a man whose nervous system has been drawn on too largely in preparation or endeavor to make a good showing.

Whoever has attempted to study out a puzzling question in an examination in a rather difficult subject, and had at the same time a History examination, for example, in full process in the same room with him, can appreciate the difficulties of passing a good or even fair examination. From a careful study of the scheme of examinations, it seems that not all the rooms which are and can be used for examinations are put in use at the same time, but rather, as few as possible are used. It is to be hoped that the examiners will bear these objections in mind in selecting rooms, and remedy them, as far as possible with the present accommodations.

Any one having copies of Nos. 4 and 6 of the present volume of THE TECH can dispose of them for the usual price, at the office, room 30.

The Tech, 1885-6.**BOARD OF DIRECTORS.**

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IN order to call out some of the hitherto undeveloped talent of the patrons of THE TECH, and also to give them the benefit of its improved financial condition, the management has decided to offer cash prizes to the amount of \$40, as follows; two prizes, of \$10 and \$5 respectively, for the best drawings or cartoons, and two of \$15 and \$10 respectively, for the best continued stories. The competition is subject to the following conditions:—

Each drawing or manuscript must be handed in on or before Oct. 15, 1885, and is to be the exclusive property of THE TECH.

Each drawing or manuscript must be accompanied by the author's name in a sealed envelope, distinctly marked with the title of the design or manuscript which the envelope accompanies.

No competitor shall receive two prizes. An illustrated story shall receive only one prize, though illustrated by some one other than the author.

All manuscripts must be written on one side only of letter size paper ($9\frac{3}{4} \times 7\frac{3}{8}$), the sheets to be securely fastened together in such a manner that the contents may be easily read. The paper should not be folded.

All drawings should be on smooth paper, in India ink, and of not more than 12" in either dimension.

The competition for these prizes is open to graduates and students of the Institute only. The award will be made as soon as practicable after Oct. 15, by competent and disinterested judges, selected by the board of directors.

The stories should be of such a length as to cover from ten to twenty pages of THE TECH, as printed during the past year.

Only a Bit of Paper.

'T was only a bit of paper,
Only a note to Pa;
Yet to me more cruel
Than any he 'd had so far;
Bringing the dismal story
Of all that I did n't know
Of physics, and math. and German,
All printed, and signed "Munroe."

Methinks from its page so hateful,
I see some grim words start,—
Words so familiar and cruel,
Bringing despair to my heart.
For they carry me back to old "Rogers,"
Up one flight, and in room twenty-one,
And these are the words on the black-board:
"At twelve, this exam. must be done."

Only a bit of paper,
Innocent looking enough;
But the Faculty's rules are unswerving,
And not made of changeable stuff;
So to grind through vacation I 'm doomed;
Hard luck, to be sure, but remember,
"Conditions acquired in May
Must always be met in September."

E. PITHET.

Loammi Baldwin.

NO man so well deserves the name of the father of civil engineering in America as Loammi Baldwin. Living, as he did, before the days of the railway system, and almost before engineering was recognized as a profession, his name is known to very few at the present time; but there is no one man among the leaders in industrial work in this country to whom we owe more. There were very few works of internal improvement carried out in America during the first thirty years of the present century, with which Mr. Baldwin was not concerned, and his two great works, the government dry docks at Charlestown and Norfolk, stand to-day unsurpassed among the great engineering structures of the country.

The subject of our sketch was the fourth child of Colonel Loammi Baldwin, a noted citizen of Woburn, in this State, and a distinguished soldier under Washington during the Revolutionary War; serving at the siege of Boston, at

New York, and at the memorable crossing of the Delaware, on the night of Dec. 25, 1776. After the war, he was for many years high sheriff for the county of Middlesex, and he also represented Woburn in the General Court. He was one of the original corporators, and a large proprietor of the old Middlesex canal, built to connect Lowell with Boston, and the entire work was constructed under his superintendence. In a very different direction we are also indebted to the elder Loammi Baldwin, as it was through him that the well-known Baldwin apple was perfected and brought into use.

Loammi Baldwin, the younger, was born at North Woburn in 1780. He fitted for college at Westford Academy, and passed through Harvard College, graduating with the famous class of 1800, in which were Judge Lemuel Shaw, Joshua Bates, Washington Allston, Charles Lowell, Joseph S. Buckminster, and other noted men. His scholarship does not seem to have been very high while in college, but he was unequalled for telling good stories, and was a universal favorite. His inclination seems to have been towards mechanical subjects, to which very little attention was paid at that time. It was during his college life that, with his own hands, he made a clock which kept very good time, and was the wonder and admiration of his class. At the semi-annual visitation of the committee of the Overseers, preceding Commencement, we find Baldwin put down as No. 9 on the list for "an exhibition in mechanics." At Commencement, he does not seem to have had any part, but in 1806 we find him recorded as vice-president of the Phi Beta Kappa, John Thornton Kirkland being president.

Like many others, Mr. Baldwin does not seem to have found out at once for what he was intended. Upon graduating, he entered the law office of Timothy Bigelow, at Groton. But even here Nature asserted her rights, and we find him constructing with his own hands a fire engine, of which the village stood in desperate need; and this small engine is still in active service after a use of over eighty years, and will throw a stream over the highest roof in town.

Having completed his legal studies, he opened an office in Cambridge in 1804; but his love for mechanical matters soon showed him where his work lay, and in 1807 he went to England to pursue the study of civil engineering. In 1812 he opened an office in Charlestown, and was employed by the State in erecting fortifications about Boston Harbor. A little later he was engaged to survey the "Falls of the Ohio" at Louisville, Ky., with a view to building a canal around the rapids; and soon after, he was employed in making surveys for canals in Virginia, and was also in charge of the Union Canal of Pennsylvania. Having, however, a disagreement with Gov. Mifflin in regard to the proper size of the canal and its locks, he left the State, and returned to Charlestown. It afterwards turned out that Mr. Baldwin's opinion was the correct one in regard to the Pennsylvania canals.

About this time he published a very able pamphlet, "Thoughts on Political Economy," and also a carefully written description of the Middlesex canal, and a memoir of his father's early friend and companion, Benjamin Thompson, better known as Count Rumford. In 1824 he spent a year in France in the study of engineering and in the collection of publications upon that subject, and laid the foundation of what was, at that time, the best engineering library in this country.

Soon after his return home he was placed in charge of surveys to ascertain the practicability of building a canal from Boston to the Hudson River, and at that early date he proposed piercing the Green Mountain Range almost exactly on the location of the present Hoosac Tunnel.

Upon the death of Uriah Cotting, who had commenced the construction of the Boston Mill Dam, now Beacon Street, Mr. Baldwin took charge of that work, and carried it to a successful completion. In 1826 he made an elaborate report to the Salem Mill Dam Corporation in regard to extensive dams at Beverly Bridge. In 1835 he made an extremely valuable report on introducing pure water into the city of Boston, in which a very full examination is made of



cisterns, common and artesian wells, aqueducts, conduits and pumps; and full descriptions are given of the water works of ancient and modern Rome, Constantinople, Lyons, London, Paris, Liverpool, Manchester, Edinburgh and Glasgow, Philadelphia, Cincinnati and Richmond. The various ponds west of Boston were discussed, the capacity of different forms and sizes of conduits considered, a complete plan and profile was shown from Boston to Farm and Long Ponds, and suggestions were also made for increasing the capacity of Jamaica Pond by various feeders.

In 1835 Mr. Baldwin made a very careful gauging of the Androscoggin River at Brunswick, in Maine, with a view to developing the water power for manufacturing purposes. Recent measurements have shown his work to

have been done with the utmost exactness, and the results to have been entirely reliable.

In 1836 the subject of our sketch was engaged in making surveys and plans for a canal to connect the town of Darien on the Altamaha River, and twelve miles above its mouth, with the harbor of Brunswick, in Georgia, a distance of about thirteen miles. By this work the immense interior of Georgia was to find a port for shipment, instead of being obliged to rely upon Savannah or Charleston. This work was not completed, but the plans, generally and in detail, show a masterly knowledge of this branch of engineering.

Mr. Baldwin's greatest works were the two naval dry docks at Charlestown and at Norfolk. Not only were these structures unsurpassed by any works of the kind in the world at the time

they were built, but they still remain as monuments of engineering skill. The dock at Charlestown was commenced in 1827, and completed in 1834, the old frigate "Constitution" being the first vessel docked. The docks at Charlestown and at Norfolk were made from the same working drawings, although the former was lengthened about sixty feet in later times to accommodate the increased length of modern vessels of war. It is strange to look back now and to note the lack of engineering machinery for carrying on heavy work, even so late as 1830. The pile drivers used at the Charlestown dock were worked by a treadmill, although some objection was made to putting the free-born American into a machine which had so unsavory a reputation. A large part of the masonry was laid without the use of derricks, by means of inclined ways. The cost of the Charlestown dock was \$677,000, and of the Norfolk dock \$943,000, a very large sum in those days.

In addition to the above works, Mr. Baldwin was consulted in regard to almost every important work of internal improvement in his time. His great skill, wide experience, and sound judgment made his opinion sought for far and near. The impression left upon all the young men who served him as assistants, several of whom yet live, is a feeling not only of profound respect for his talent as an engineer, but of love and veneration for him as a man.

In person, Mr. Baldwin was over six feet in height, and superbly built, though inclining to be rather heavy towards the latter part of his life. His face, as shown by an admirable portrait now in possession of the family, presents one of those rare combinations of intelligence, of manliness, and of dignity, which once seen can never be forgotten; a face which shows, as Hamlet says:—

"A combination and a form, indeed,
Where every god did seem to set his seal,
To give the world assurance of a man."

G. L. V.

QUERY TO THE ARCHITECTURAL CLASS. In building a house for a dentist, would it be correct to put a *dentil* course on it?

To Althea.

AFTER A MOONLIGHT RIDE.

May I hope that these flowers recall to your mind
That glorious night when we two rode behind
The rest of our friends, in a three-seated team,
And revelled in moonlight! It seems like a dream.

Which too soon passed away,
Leaving naught but the hope
That at some future day,
We may meet once again
In as festive a mood,
When no puns shall be made
And no friends shall intrude.

Then the fair Cinderella will have on her shoe,
And listen to sentiment entirely new;
I look forward with joy to th' impending hour,
When our mutual eyes meet in Madame D——'s bower.

TH. PELL.

HISTORY IN A NUTSHELL,

OR

BOSTON WITHOUT A GUIDE.

Written by one who lives there, and knows all about it.

Knowing that there are many students in the Institute who, on account of their studies, are unable to take time to explore Boston, and consequently, knowing little or nothing about this Hub of the Universe, are often much embarrassed when questioned by friends at home about the city, etc.,—knowing this, we have at great expense of both brains and money, collected the following facts, and now present them to the public, hoping that they will prove a blessing to one and all.

BOSTON. — This venerable and ancient city dates back a good deal further than the tower of Babel. (For farther particulars see some other history.) It is situated somewhere in the State of Massachusetts, and was discovered by the Right Honorable Johnnie Sullivan, known as the Boston strong boy, in the year 1024 B. C., (beans commenced), and at that date showed many signs of extreme antiquity.

Faneuil Hall is supposed to have been the original Solomon's Temple, and Boston Common is known to be the garden of Eden, with modern improvements. The Tree of Knowledge has

lately been removed to make room for the Cogswell fountain, a beautiful work of art, which is the pride of all Bostonians. The four rivers are represented by this beautiful bronze fountain, which squirts continually.

Boston is supposed to have derived its name from the Latin word *boss*,—to be extremely fine,—and the Indian word *town*. Since Boston has become a city, some of the inhabitants have tried to change its name to Boss City, but this has not yet been done.

Boston is noted principally for its beans and culture, and the inhabitants are supposed to live on beans, and to be the most cultured race on the globe. The principal places of interest in and around Boston are Old South Church, Institute of Technology, Public Gardens, Bunker Hill, Harvard College, old Court House, and the Maverick Bank. The Old South Church was once used as a livery stable by the British (from which it gets its *hack*-neyed look). It is now used as a museum wherein to exhibit curiosities and relics. Paul Revere, it is rumored, once rode up the steeple with a lantern, to make people think he was a comet. We understand there is a new poem about his ride, but have not seen it as yet.

The Institute of Technology is noted for—but we all know what it is noted for, so we will only mention what it is not noted for. It is not noted for being a soft snap, nor for the size of its Senior classes, nor for the extent of its campus.

The principal things seen in the Public Gardens are signs inscribed, "Keep off the grass." A few other attractions are statues, the lake, babies, pretty nurse girls, small boys and cops.

Harvard College is situated in the ancient town of Cambridge, and can be reached by horse-cars (fare five cents; no smoking on the front seats). At Harvard College young men are taught to smoke cigarettes, spend money, and much other useful information.

The Old Court House is where George Washington was born in the year 1983, A. C. Tourists can go there if they please; the liberty of staying away is also awarded them.

The Maverick Bank is also another place of

interest. N. B. — Interest here is about five per cent.

The streets in Boston are unlike the one in Damascus, which was called straight. When laid out, far back in the carboniferous period, the street commissioners did not heed the injunction of the "great expounder,"—"Ye solid men of Boston, drink no strong potation"; and consequently, the lanes and avenues stagger about, so that a new student, after walking about for a short time, will go home thinking he is intoxicated.

The principal hotel is the Vendome. It is kept on the European plan, which is to charge so much for a bed that you have no money left to invest in a breakfast the next morning.

Boston includes the towns of Cambridge, Jamaica Plain, Roxbury, Framingham, Newburyport, and in fact, all Massachusetts.

The remainder of this interesting, valuable, and instructive history of Boston may be obtained at the supply-room, if you can ever find it open, in lengths to suit. Not less than a yard will be cut from the piece; positively no remnants. Come early and avoid the rush.

F. W. H.

A Tramp Over Mt. Washington.

THE summit of Mt. Washington, as is well known, commands the grandest and most extensive view of any point east of the Rocky Mountains, and hundreds of tourists visit it every summer. Of these, however, ninety-nine out of every hundred ride up the mountain, either by the railway from Fabyan's or by the carriage road from the Glen House; but by far the most romantic method of "doing" Mt. Washington is to avoid both railway and carriage road, and, to use a somewhat vulgar term, "frog it," as did the writer last summer, accompanied by a friend.

We were spending the summer among the mountains, in a little village about twenty miles from Mt. Washington; and from there we started one beautiful July morning, equipped with blankets, food and camera, for it was our intention

to take photographs on the way. We went by carriage the first ten miles as a "starter," and then set out on foot, rather heavily loaded with our packs and photographic outfit. Our plan was to make the ascent of Mt. Washington by path through Tuckerman's Ravine, made by the Appalachian Mountain Club, and to camp over night in a log-hut built by the club in the ravine for the free use of such wayfarers as we.

We visited Glen Ellis, with its fine cataract, and then, a short distance farther on, left the Glen road and took the Appalachian Club path, which strikes off from the main road three miles south of the Glen House. Following this path we soon came to Crystal Cascade; this and Glen Ellis are called the two most beautiful waterfalls in the mountains.

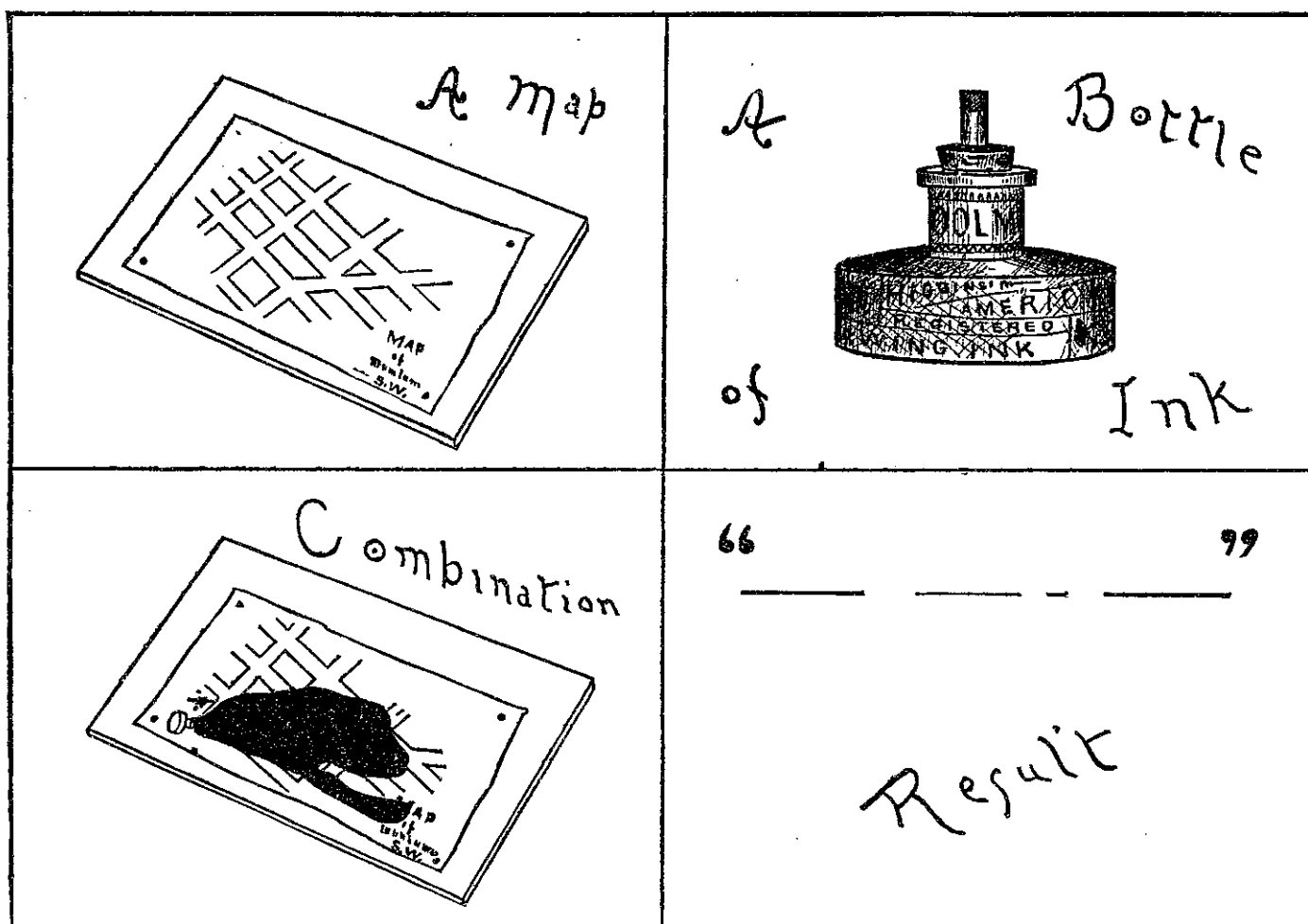
We stopped to take a photograph of the falls, and then hastened on up the path. The slope, excepting here and there, was quite gradual, and the climbing not over-difficult; but our pleasure was not enhanced by the drizzling rain that set in about three o'clock, which rendered the roots and mosses, over which we made our way, rather slippery and treacherous. The thick woods, however, served to screen us somewhat from the rain, and we made all haste to reach the hut before the storm should increase. About half past four we reached Hermit Lake, and rejoiced to see, nailed to a tree, a board bearing the cheerful inscription, "To the Hut," with an arrowhead. It was none too soon, for just then the rain began to pour down in torrents, and we hurried along the little side path to the hut with all convenient speed. Never did shelter seem more welcome than did that little log-hut, half way up Mt. Washington. It was a rude affair, covered with boughs, and over the entrance was a board on which were the initials A. M. C. (Appalachian Mt. Club). Luckily, it was water-tight, and it was well, for the storm continued unabated nearly all night.

On awaking the next morning, we found the rain had ceased; but the clouds were scurrying over the mountains in the high wind, presenting a most striking appearance. We went out to enjoy the view, and it was grand beyond

description. Before us was Hermit Lake, while beyond, and on three sides of us, like a vast amphitheatre, arose the mountain-sides, steep and rugged, the cliffs towering from one thousand to fifteen hundred feet above our heads; while the effect of the mountain-tops, partially veiled in clouds, was beautiful in the extreme. After eating an early breakfast, and taking a view of the camp, we packed up and started on the hardest part of our journey, to scale the cliffs which, from below, seemed wellnigh impregnable. Just above Hermit Lake we came upon the snow, of which there was then (the first day of August) a patch from two hundred to three hundred feet long, and from ten to fifteen feet deep, forming a kind of glacier. Above this is the poetically named "Cataract of a Thousand Streams," whose waters, pouring out in myriads of places from the nearly perpendicular cliffs, flow under the snow, and thus form the so-called "Snow Arch."

Above the line of vegetation the path was marked by patches of white paint on the rocks at intervals of two or three rods, and this part of the ascent over the rocky cone was extremely difficult, heavily loaded as we were. We were in the clouds almost all the way up, and got only occasional views. We arrived at the summit about eight o'clock in the morning, the distance from Hermit Lake being two miles. The wind was blowing about sixty miles per hour, and it was very cold. Below us the landscape was perfectly clear; but the light clouds blew over the summit like waves over a ship at sea. Our glimpses of the outside world were but momentary, when, the clouds parting for the instant, the whole vast panorama would break suddenly upon our view, and then as suddenly be lost to sight, as the clouds closed in again like a curtain.

In the clear intervals we succeeded in signaling our friends, twenty miles distant, by sending a flash of light with an ordinary hand-glass, and we distinctly saw their flashes in reply. This, by the way, is a common means of signaling in the mountains, and flashes of light may be sent to almost an incredible distance in this



manner. We visited all the points of interest in and around the Summit House, including the U. S. Signal Service Station, with its numerous interesting instruments, etc., and previous to our departure we had ourselves photographed on the piazza of the Summit House, where, wrapped up in our blankets, and with hatchet and packs, we presented the appearance of a couple of brigands, rather than harmless travelers.

We started on the descent about 11 o'clock, striking the Crawford Bridle Path below the rocks. Soon after entering the path, we passed the "Lake of the Clouds," a little sheet of water situated at a height of five thousand and fifty feet.

Our whole journey down the bridle path, which is nine miles long, presented a continuous succession of the most beautiful views on either side of the ridges along which it ran. Our course led us over Mts. Munroe, Franklin, Pleasant and Clinton, so we were by no means going down hill all the time. This was one of

the most enjoyable portions of our tramp, though toward the last it became rather tedious, especially through the long stretch of woods, before arriving at the Crawford House.

We reached Crawford's about 4.30 P. M., tired and hungry, and after making ourselves as presentable as possible, we took the train from there through the Notch, and thence returned to our headquarters, after a most enjoyable trip.

L.

The class of '87 voted, at a meeting held last Saturday, to issue an Institute Annual next year. The following were chosen as the board of editors: Sturges, Banes, Haskell, Sprague, Peters, Spaulding and Gulliver.

This project, which has succeeded so well in many of our sister colleges, surely ought to meet with great favor from all Tech students. We hope that the editors will have the hearty support, not of '87 alone, but of the whole Institute, for an Annual is a college affair.

Volumetric Estimation of Phosphorus in Wrought Iron and Steel.

[From the Engineering and Mining Journal for May 9.]

THIS method for the estimation of phosphorus by the volume of the yellow precipitate of phospho-molybdate of ammonium appears well adapted for use in cases where frequent and rapid phosphorus determinations are necessary, and where it is not so much an object to obtain very accurate results, as to make sure that the percentage of phosphorus in wrought iron or steel is below a given limit. Though the method is not a new one, it appears to be known to so few that the writer, who saw it for the first time carried out at the important steel works in Peine, Hanover, thinks it worth while to draw to it the attention of those interested in the manufacture of wrought iron or steel, more especially by the Thomas and Gilchrist process.

The burette used for measuring the bulk of the yellow precipitate is a tube of from 155 to 160 mm. in length. The lower part of it, which is destined to receive the molybdate precipitate, is uniformly 3 mm. internal diameter for a length of about 80 mm., and is graduated from the bottom in divisions 1 mm. apart. The upper part of the tube, which is meant to retain the fluid from which the phosphorus has been precipitated, has a diameter of about 22 mm., and a length of about 55 mm. The transition between the narrow and wider parts is a gradual one, forming an angle of say 68° or 70° with the horizontal, so that the precipitate either does not lie on the sides at all, or can, by gently tapping the burette, be made to roll down to the graduated part of the tube.

The estimation is carried out as follows: 0.0882 gm. of wrought iron or steel is dissolved in 10 or 12 c.c. of nitric acid (specific gravity 1.2). After complete solution, the phosphorus is precipitated in the same glass by addition of nitric acid solution of molybdate of ammonium.

The precipitate is allowed to settle completely, and, after the greater part of the supernatant liquid has been siphoned off, is transferred to the burette. Every fourth division on

the burette is numbered; that is to say, the fourth from the bottom is numbered 20, the eighth 40, the twelfth 60, and so on up to 340, the value of the intermediate divisions being, of course, in proportion. The number indicating the space filled by the precipitate after the same has settled is multiplied by 2.5 (a factor determined by experiment), the result being the amount of phosphorus in the iron or steel expressed in thousandths per cent.

In Peine, where quite a number of these determinations are made daily—the whole operation lasts from three to four hours—the burettes are placed on racks made for the purpose, to allow the precipitate to settle. The burettes are made by C. Desaga, of Heidelberg, and cost one and a half marks (thirty-seven cents) apiece.

W. R. F.

Freiberg, Saxony, April 14.

Eighty-Five's Theses.

THE titles of the theses of the graduating class, obtained from the Secretary of the Institute, are as follows:—

CIVILS.

The Sanitary Influence of Modern Improvements, by Henry Dexter Bennett.

Design for a Hinged Arch for the Boston Public Garden, by Walter Kendrick Harrington.

A Comparison of Current Meters and an Investigation of Sub-surface Velocities, by Eben Giles Merrill.

The Sewerage of Malden, Mass., by Joseph Edson Nute.

Proposed Sewerage System for the Town of Canton, Mass., by Charles Francis Spring.

System of Water Supply for the Town of Canton, Mass., by Erastus Worthington, Jr.

MECHANICALS.

An Investigation of the Modulus of Elasticity and some other Properties of Cast Iron, by Heywood Cochran.

An Experimental Study of the Balancing of the Action of the Reciprocating Parts of a Locomotive, by Edward Henry Dewson, Jr.

Results of Experiments on the Steam Engines

in the Mechanical Engineering Laboratory of the Massachusetts Institute of Technology, by Thomas Wilder Fry.

A Study of the Effect of the Reciprocating Parts on the Crank-Pin Pressure of Certain Engines, by Frank Herbert Lord, with Robert Eaton Richardson.

An Investigation of the Valve Gear of Several Types of Stationary Engine, by Tracy Lyon.

Experiments on the Slipping and Friction of Oak-Tanned Leather Belts, by Allyne Litchfield Merrill.

Design for a 16" Engine Lathe, by Charles Russell Richards.

MINERS.

Treatment of an Argentiferous Manganese Ore by Chloridizing, Roasting and Pan-Amalgamation, by David Baker.

Concentration of Calumet Coarse Sand by Stamping and Washing for Copper, by Robert Rhea Goodrich.

Copper Refining, by Hugh MacRae.

The Smelting of Vershire Copper Ore and of Argentiferous Galena Concentrates, by Everett Morss.

The Geology of the Bradford (Pa.) Oil Rocks, by Frederick Haynes Newell.

The Smelting of Calumet "Black Jack" for Black Copper, by Newbert Moses Randall.

Treatment of Nova Scotia Gold Ore by Stamp-Amalgamation and Chlorination, by Charles Stanley Robinson.

Treatment of Somberete Ore by Patera and Russell Processes, by Otis Tolbot Stantial.

Concentration of Low Grade Ores, by George Philias Vanier.

ARCHITECTS.

Design for a Theatre, by Eleazer Bartlett Homer.

Some Points in Theatre Construction, by Edward Raymond Benton, Ph. D.

CHEMISTS.

Nitrogen in Sewage, by Charles Ricketson Allen.

Albertite, by Frederick Fox, Jr.

Action of Bromine on the Substituted Anilines, by Henry Martin.

Decomposition of Paraffine Hydrocarbons by Heat, by Henry Paul Talbot.

ELECTRICALS.

Battery Transmitters, by William John Hopkins, A. B.

Electro-Motors and their Efficiency, by Frank Albert Pickernell, with Herbert Gale Pratt.

GENERAL COURSE.

Studies in the Comparative Anatomy of the Sympathetic Nervous System, by Marcella Imelda O'Grady.

The Glee Club Concert.

THE last concert of the season given by the Glee Club took place in Chickering Hall, Tuesday, May 5.

The departures from the customs followed in former concerts made the character of the entertainment somewhat different from that which a part of the audience might have wished, yet all seemed willing to overlook some undeniable faults, and showed their appreciation of the entertainment as a whole. Following is the programme:—

I.

- | | | | |
|---------------------|-------------------------------|------------------|------------|
| 1. Overture. | Bridal Rose | . . . | Orchestra. |
| 2. Songs. | { <i>a.</i> Bold Fisherman. } | . . . | Glee Club. |
| | { <i>b.</i> Hullee! Hulloo! } | | |
| 3. Glee. | More and More | . . . | Glee Club. |
| 4. March. | Royal Arcanum | . . . | Orchestra. |
| 5. Serenade. | Sleep in Peace. | . . . | Glee Club. |
| 6. Flute Quartette. | | | |
| | Prof. E. Letang, | Mr. E. B. Homer, | |
| | Mr. W. B. Crocker, | Mr. O. Walburg. | |
| 7. Glee. | Der Kleine Rekrut | . . . | Glee Club. |

II.

- | | | | |
|----------------------|---|-------|------------|
| 1. Overture. | Emanon | . . . | Orchestra. |
| 2. Songs. | { <i>a.</i> Baa! Baa! Black Sheep. } | . . . | Glee Club. |
| | { <i>b.</i> Crambambuli. } | | |
| 3. Vocal Quartette — | Chantez le Printemps. | | |
| | Messrs. Haskell, Hussey, Fry and Homer. | | |
| 4. Minuet | . . . | . . . | Orchestra. |
| 5. Serenade. | While She Sleeps | . . . | Glee Club. |
| 6. Songs. | { <i>a.</i> Tech Soph's Song. } | . . . | Glee Club. |
| | { <i>b.</i> Campmeeting Song. } | | |
| 7. Selection. | Robin Adair | . . . | Glee Club. |

The first overture showed a lack of proper amount of rehearsing, on the part of the orches-

tra, which cannot safely be indulged in by an organization of amateurs whose time is so fully occupied by other work of such different nature. The same defect was noticeable in the march, although in this instance, the time was more accurate.

The college songs were well received; "More and More" was, however, rather too much for the tenors, and a little uneven.

The serenade was a decided improvement over the preceding portion of the first part. The applause which followed the performance of the flute quartette was responded to by an encore piece, which, however, was not so well executed toward the end, owing to the difficulty experienced by one of the performers in keeping time. The German glee was given with a confidence which must have been encouraging to the Professor who imparts that language.

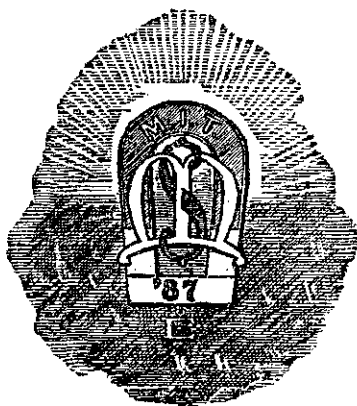
In the second part Mr. Bullard's overture and orchestration of Schubert's Minuet seemed well adapted to the powers of the orchestra, and both were well rendered and received. The singing of the quartette lacked confidence and animation. Mr. Underhill's "Serenade" was sung with good expression, and in composition and execution merited the applause awarded it. The topical songs of the sixth number, by Mr. Sprague, were amusing, and might perhaps have better exchanged places in the programme with "Robin Adair"; the latter piece was creditably sung, and showed evidence of more careful drilling than some of the other numbers, but was not a lively *finale* for a concert of this character.

By introducing some songs of a more pretentious nature into its programme, the club laid itself open to comparison with other organizations in whose province such songs seem to be more appropriate, and it cannot be expected that the results of the comparison will always be favorable. While the satisfaction of being able to produce such songs creditably must be an incentive to the members of the club, it should be remembered that some disappointment would naturally result to the Tech portion of the audience, from a programme con-

taining a comparatively small number of college songs.

Altogether, in the work of the year, the club has made a good advance in smoothness and unity of action and in facility of expression, and the results indicate the possibility of a successful season next winter.

Society of '87.



The annual sociable of the Society was held in Berkeley Hall on the evening of May 2, the occasion being set aside as ladies' evening. After the dispensing with the business meeting, a programme of unusual interest was presented, and was as follows:—

1. PIANO DUET — Priests' March . . . *Mendelssohn.*
Mrs. Shepard and Miss Dana.
2. QUARTETTE — March Arion Club.
3. SOCIETY RETROSPECT Mr. Brace.
4. HUMOROUS SONG — She and I . . . Mr. Thomas.
5. ZITHER SOLO — Devils' Dance . . Mr. Richardson.
6. SONG — Forever Miss Kileski.
7. SONG — Across the far blue hills, Marie. Mr. Miller.
8. RATHER FUTURE Mr. Spaulding.
9. BALLAD — The Devoted Apple . . Miss Kileski.
10. SONG — Thy Sentinel am I . . . Mr. Mirrlees.
11. RECITATION Mr. Thomas.
12. COLLEGE SONGS Arion Club.

Mrs. Shepard, Miss Kileski and Mr. Richardson, having by previous kind offices shown their sympathy for things at the Institute, need no introduction to our students, and their numbers were delightful. The mere announcement of Mr. Thomas was enough to put every one in a good-humor, and Mr. Miller's songs were much enjoyed. After the refreshments, dancing was indulged in, Miss Dana kindly officiating at the piano.

The thanks of the Society are due to one and all who aided in making this one of the most enjoyable events of the year to those fortunate enough to be present. Much praise is due to the committee of arrangements for the success of the evening.



Wm. Otis Dunbar, '79, in Signal Department of the Pennsylvania Railroad, Philadelphia, Pa.

Harry B. Fullerton, '79, with Holyoke Water-Power Company, Holyoke, Mass.

William. T. Haskins, '79, Bureau of Chief Engineer, Department of Public Works, New York City.

Raphael M. Hosea, '79, with Lewis M. Hosea, Cincinnati, as civil and mechanical engineer, and consulting expert.

Fred. B. Knapp, '79, Supt. Buildings and Instructor in Mathematics, Harvard University, Cambridge, Mass.

Fred. H. Lane, '79, superintendent of Chambersburg Woolen Mill, Chambersburg, Pa.

Fred. R. Loring, '79, studying in Germany.

William W. Macfarlane, '79, assistant superintendent Quaker City Dye Works, Philadelphia, Pa.

Sidney T. Pope, '79, foreman erecting shop, locomotive department, Chicago, Burlington & Quincy Railroad, Aurora, Ill.

George F. Riggs, '79, assistant engineer, Kansas City, Springfield & Memphis Railroad, Memphis, Tenn.

Vibe C. Spicer, '79, engineer, Union Switch & Signal Company, Pittsburg, Pa.

Wm. S. Stearns, '79, superintendent of Stearns & Fosters' Cotton Factory, Wyoming, Ohio.

Roscoe L. Chase, '84, chemist, Quaker City Dye Works, Philadelphia, Pa.

George L. R. French, '84, on Burlington & Missouri River Railroad, Lincoln, Neb.

G. T. Jarvis, '84, superintendent first division

Mexican Central Railroad, headquarters at City of Mexico.

Philip S. Morse, '84, Pueblo Smelting and Refining Works, Pueblo, Col.

A. Stuart Pratt, '84, manager Brush Lake Cattle Company, Plum Creek, Neb.

William J. Rich, '84, chemist, West Pennsylvania Steel Work, Leechburg, Pa.

Elliot T. Sturgis, '84, assayer at W. A. Clark's Calura Mine and Works, Meaderville, Montana, Territory.

I. W. Litchfield, '85, secretary of Ferronite Manufacturing Company, Warwick, New York.

C. C. M. I. T.

THIS year's work of the Cadets was happily ended on Saturday, the 9th, by their prize drill at the Mechanics Fair building.

The battalion has steadily increased in numbers from year to year, and on this occasion four full companies contested for the two silk banners given by the Class of '87.

The exercises were begun by a battalion drill under command of Major Frank E. Shepard, in which the steadiness of the men and the precision of the officers showed how careful and complete has been the instruction of Gen. Moore.

After a selection by Baldwin's Cadet Band, the different companies marched in 'mid the applause of their friends, and went through a variety of movements under the close scrutiny of the judges. Following this was the competitive drill for the individual medals, under command of Adjutant Hollon C. Spaulding. The exhibition closed with a dress parade and the award of prizes.

Col. Strachan, in behalf of the judges, and with a few remarks both fitting and proper to the occasion, presented the first company prize to Capt. D. M. Blair, Co. B, and the second to Capt. H. O. Poor, Co. C. He also awarded the first and second individual medals to Sergt. W. T. Keough, Co. C, and Sergt. T. A. Foque, Co. C, respectively; and a special prize for those who had never drilled before this year to Corp. W. L. Dearborn, Co. B.

After the joy of the friends of the victors had been appropriately demonstrated, dancing began and was continued through the remainder of the afternoon.

The Architectural Exhibition.

ON the 14th, 15th, and 16th inst., the architects gave an exhibition of the year's work in problems, water color and charcoal sketches, in the drawing-room and library.

Although comprising only a part of the work of each student, and many of the best drawings having been sent to the exhibition at New Orleans, the exhibit showed very fairly the work of the department; and it is not too much to say that the result is highly creditable to both professors and students.

Space will not permit a detailed mention of the drawings, there being few which have not some praiseworthy feature, and many being exceptional in design and rendering. The little time allotted to the cast and life classes, and to the water colors, seems to have been well spent, and the facility which comes of a careful appreciation of color is clearly shown in the better rendering of problems.

Seniors' Evening.

THE last exercises of the Class of '85, with the exception of graduation, will be held in Huntington Hall, Monday evening, June 1. The idea of the members of the class is to assemble, with their friends, for a last meeting among the familiar scenes of the past four years, and to enjoy an affair less formal than that of graduation day. To this end, a program has been prepared, which includes an overture and selection by the class quintette; the reading of the class history, poem, and prophecy; instrumental and vocal music by individual members of the class, and singing by the Glee Club.

The committee of arrangements has decided to issue tickets of admission, to avoid overcrowding the hall, and these tickets will be distributed among the Faculty and the members of the class. It is hoped that the latter will be able to spare a sufficient number of tickets to the lower

classes, who will doubtless be interested in this new departure, but for whom there seems to be no other fair and practicable way of providing.

Much interest in the "Seniors' Evening" has been shown by Techs and their friends and professors, and if the precedent established by '85 is followed by future Senior classes, it will become one of the most enjoyable occasions of Institute life, and one which will be looked forward to by all entering classes.

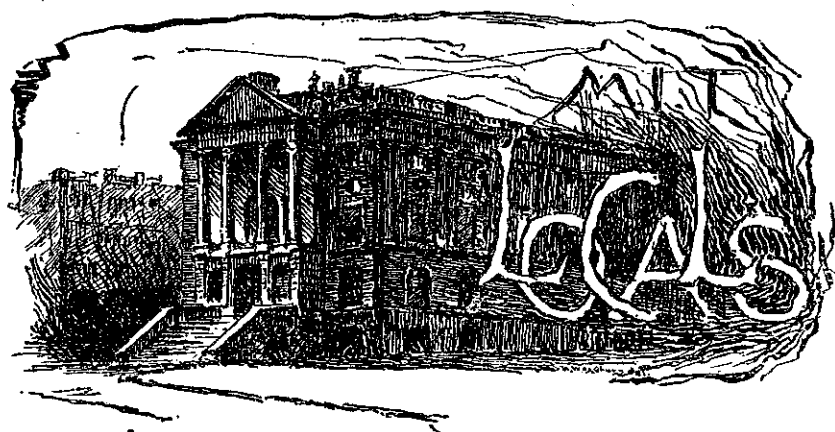
Noticeable Articles.

THE *Quarterly Review* for April contains a learned and very important paper on the Early History of Britain, interesting both to the student of the philosophy of history, and to readers who care to ascertain the truth on that much-debated question, the origin of the English. The key-note is given in the following sentences: "Since Prof. Brewer's convincing vindication of the established method of treating our history in its unity, from the first knowledge of the British Isles supplied by written records or by archaeological research, there has been a steady reaction against the narrow ethnological view of which Mr. Freeman has been the apostle, and Mr. Green the more lively and popular teacher; and such works as those of Mr. Elton (*Origins of English History*), London, 1882, a very learned and important work, and Prof. Rhy's (*Celtic Britain*) in the interesting little series published by the Christian Knowledge Society, 'containing,' says our reviewer, 'as might be expected from its author's reputation, the results of learning and labor, altogether disproportioned to its modest form and dimensions' (he is Professor of Celtic at Oxford), are but a sample of a long list which we might have prefixed to this article.

"The formula which used to be dinned into our ears that *we Englishmen are English*, is one of those curt plausibilities which impose on the unthinking, but of which every word provokes exact criticism. *Who are we*, and in what sense *English*? . . . The whole history of Britain, both in England and even more strikingly in Scotland, is a lesson in the fallacy of the principle of 'nationalities' of race, but a signal proof of the true principle of patriotic and political nationality. We find the soundest scientific instruction — showing in the British Isles an example as signal as any in the world — of nationality founded on their fusion rather than on purity of race." One rather enjoys seeing the "bumptiousness" of that most dogmatic and ill-mannered of scholars, Mr. Freeman, taken down by writers who are more than his match in learning on his own ground. Are not the people of these United States formed out of a mixture of all the civilized and some of the uncivilized races of the globe, rapidly becoming a "patriotic and political nationality"? No competent student of history, however, would deny that race plays an important part in historical development.

W. P. A.

THE *Mining Review* for March 11, 18, and 25 contains a very good article by John C. Jackson, M. E., on the Kronhuke process of amalgamating silver ores. It is not a new process, but little of value has ever been written about it, as the details were kept secret.



Farewell to '85.

Keep off the campus!

Shall we see you next year?

M. I. T. 'rah! 'rah! 'rah! vacation!

Mr. J. H. Mirrlees, '87, sails for Europe on the 1st of June.

It is rumored that German is to be added to the requirements for admission.

The annual supper of the Architects took place at the Quincy House on the 15th inst.

We are in the midst of the fight, and if we must surrender at all, we will hope it will be *condition(al)* surrender.

The graduating class of '85 has twenty-nine regular students. Of these six take Course I., seven Course II., eight Course III., two Course IV., four take Course V., one Course VI., and one Course IX. Only one of the above is a young lady.

A scientific investigating expedition, including among its members Prof. Hyatt, Mr. Barton of the department of Geology, and Bartlett and Burlingham of the Junior Class, is to go to Newfoundland and Labrador this summer, starting about June 1.

At the close of each year there is usually a movement to get up a party for the westward journey which is taken by so many of our students at the close of the examinations. In January last quite a large number took the night boat via Fall River for New York, and a most pleasant evening was spent, singing with accompaniment of banjo and guitar. We would suggest this short journey, which so many can take in common, as a happy prelude to the summer's parting.

The class of '85 is planning an excursion on the harbor, for an afternoon of the week preceding graduation.

The silver question is to be thoroughly discussed in the June number of the *North American Review*, by Prof. Sumner, General Walker and Prof. Laughlin,—the champions of three great educational institutions, viz., Yale, the Massachusetts Institute of Technology, and Harvard.—*Evening Traveller*.

Thanks are due to Mr. S. R. Bartlett for his present to THE TECH of a copy of the battalion photograph. Mr. Bartlett has recently taken several groups and scenes about the Institute. One of his best, which forms a very interesting memento, is a photograph of the buildings, showing Kidder, Rogers and Natural History.

The class of '85 was entertained by Prof. Lanza in his usual happy manner on Monday evening, May 11. Among those present were Prof. Runkle and Miss Runkle, Prof. Otis and Mrs. Otis, and Mr. and Mrs. Pickering. A very enjoyable evening was spent, and the class separated outside with three cheers for Prof. Lanza.

The annual meeting and dinner of the 2G was held at Young's on Friday, May 8, and was one of the most successful in its history. The following officers were elected for the ensuing year: president, W. R. Ingalls, '86; vice-president, J. E. Simpson, '86; secretary, N. Q. Stewart, '87; treasurer, A. C. Anthony, '86. After the business meeting, the members sat down to the dinner, which was one of Young's best. In the after-dinner ceremonies, Capt. D. A. Lyle, '84, officiated as toast-master.

Base Ball Games.

HAVERHILL, May 6.

	1	2	3	4	5	6	7	8	9
Haverhills,	4	2	0	1	0	0	2	0	3—12
Techs,	1	0	3	1	1	1	0	0	3—10

Base hits: Haverhill, 14—17; Techs, 14—18. Errors: Haverhill, 7; Techs, 14.

UNION GROUNDS, May 9.

	1	2	3	4	5	6	7	8	9
Beacons,	5	0	1	7	0	1	0	2	0—16
Techs,	0	1	0	1	1	0	0	2	2—7

Base hits: Beacons, 10—13; Techs, 11—15. Errors: Beacons, 12; Techs, 28.



AN EXAMPLE OF EVOLUTION.

Our friend of '89 as he appeared this spring, and as he probably will appear next spring, — being an illustration of what scientific influences may do for a man.

Tempora Mutantur.

In olden Tyme wh^{ne} valiaunt Knyghtes
Disputed fr each otheres Ryghtes,
Wh^{ne} Maydes wre foughte fr — Th^{ne} I wot
Fr Monie, love was nevere boughte.

Alack! Those goode old Daies have passed,
Ye Foppe succeedes ye Knyghte at laste;
Love breedes contention as of Olde,
But Steele has given waie to Golde!

Life.

A SNAKE STORY.

"You have a very rich soil here," remarked a tenderfoot to a Dakota farmer.

"Rich! Well, I should say so. Two years ago a young man from the East came out here. He carried a snakewood cane. He stuck it in the ground and left it there."

"I suppose," remarked the tenderfoot, with a smile, "you mean to tell me it sprouted."

"Sprouted! Well, I should say it did, and blossomed, too. Why, last year I killed twenty bushel of black snakes on that patch of ground, and each one was varnished and had a hammered-silver head." — *Graphic.*

A chance acquaintance — the bunco man.

The Rise of Silas Lapham — in the morning.

FOR HIS HEALTH.

Policeman. — "Well, Mr. Soaker, seems t' me yer up early this mornin'."

Mr. Soaker (whose wife refused to open the door last night). — "Yesh (hic); doctor 'dvised me (hic) t' drink pure fresh (hic) milk every mornin'. I'm waitin' (hic) for the milkman." — *Puck.*

WHAT MAMMA SAID.

"Are you enjoying your dinner?" asked Bobby of the minister, who was taking a Sunday dinner with the family.

"Yes, Bobby," responded the minister, pleasantly.

"Mamma said this morning that she thought you would, as she didn't suppose that with your small salary and big family you got much to eat from one week's end to another." — *N. Y. Times.*

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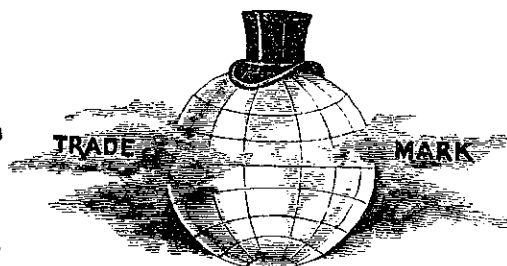
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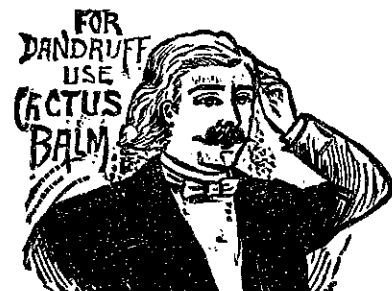
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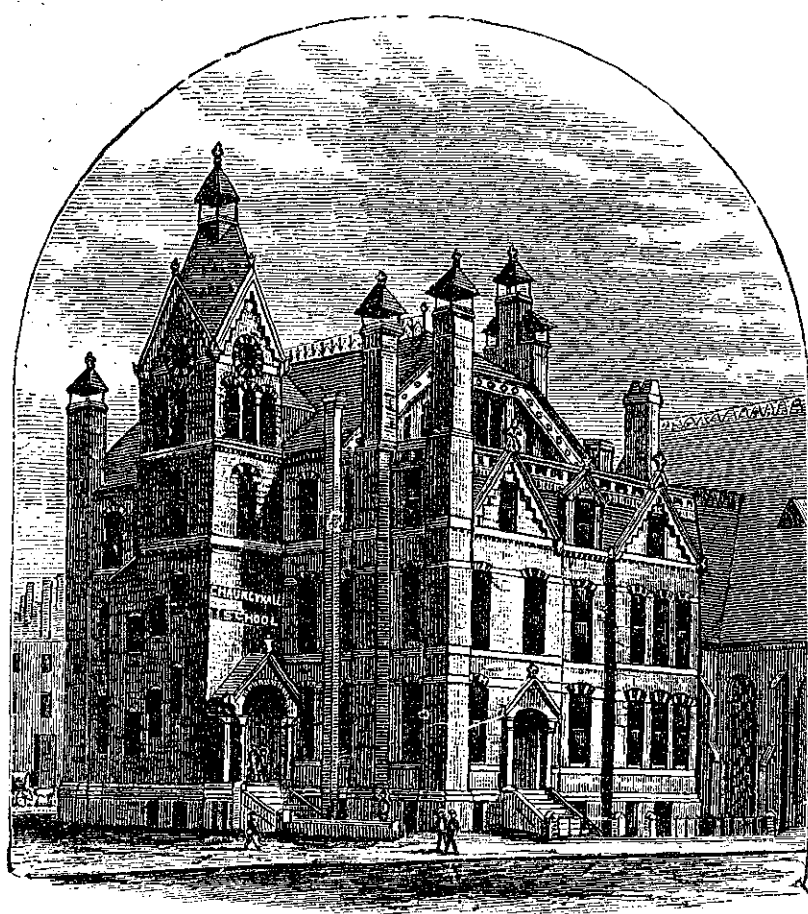
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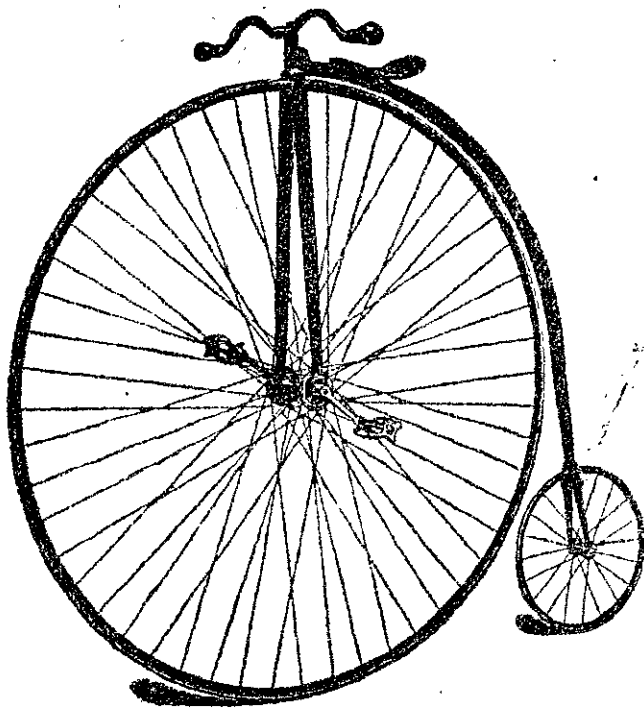
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